

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference CERN	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/IB2004/000276	International filing date (<i>day/month/year</i>) 03.02.2004	Priority date (<i>day/month/year</i>) 03.02.2004
International Patent Classification (IPC) or both national classification and IPC H01J47/06		
Applicant CERN ORGANISATION POUR LA RECHERCHE... et al.		

<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 30 sheets.</p>

<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the opinion II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application
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Date of submission of the demand 12.07.2005	Date of completion of this report 07.12.2005
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>	Authorized Officer Schmidt-Kärst, S Telephone No. +49 89 2399-2488



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/IB2004/000276

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-18 received on 12.07.2005 with letter of 08.07.2005

Claims, Numbers

1-11 received on 12.07.2005 with letter of 08.07.2005

Drawings, Sheets

1/8-8/8 received on 12.07.2005 with letter of 08.07.2005

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/B2004/000276**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-11
	No: Claims	
Inventive step (IS)	Yes: Claims	1-11
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-11
	No: Claims	

2. Citations and explanations

see separate sheet

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability

1. Reference is made to the following documents:

- D1: J. Veloso et al., 'A proposed new microstructure for gas radiation detectors: The microhole and strip plate', Review of Scientific Instruments, vol. 71, nr. 6, June 2000
- D2: J. Veloso et al., 'The microhole and strip plate gas detector: Initial results', Review of Scientific Instruments, vol. 73, nr. 2, February 2002
- D3: R. Bellazzini et al., 'The micro-groove detector', Nuclear Instruments and Methods A, vol. 424, nr. 2-3, 21 March 1999
- D4: S. Keller et al., 'Sparks in MSGC's', Nuclear Instruments and Methods A, vol. 419, nr. 2-3, 21 December 1998
- D5: B. Adeva et al., 'Performance of the Microwire Detector', Nuclear Instruments and Methods A, vol. 461, nr. 1-3, 1 April 2001

2. Documents D1 and D2 disclose a gas radiation detector having a microhole and strip plate structure (MHSP) which merges the structures and characteristics of a gas electron multiplier (GEM) and a microstrip plate (MSP) in one single plate (cf. D1: abstract; paragraph 'I. Introduction'). The detector comprises a polymer film metal coated on both sides with a matrix of holes etched through the film and a standard microstrip pattern etched on one side (cf. Fig. 1: microstrip side).

Document D2 reports on operating the MHSP as a gas proportional counter (cf. figure 2). Variable bias voltages are established between the detector entrance window and the slotted front surface of the MHSP, $-V_{d1}$, between this surface and the cathode strips, $-V_{hole}$, between the cathode and anode strips of the microstrip structure, $-V_{ac}$, and also between the anodes and a backplane of the detector, V_{d2} . The entrance window is thus biased negatively with respect to the MHSP, acting as a drift electrode (cf. page 488, left column - page 489, left column).

Electrons coming from the drift region above the grid side will thus be focused toward the matrix of holes crossing the MHSP. The electric field inside the holes is high enough to allow charge multiplication. With a suitable potential difference $-V_{ac}$ applied

between the cathode and anode strips, the electrons emerging from the holes are deflected toward the anodes where a second multiplication occurs. The charge is then collected by the anodes thus acting as a read-out electrodes.

Where position information is needed the grid electrode of the MHSP can be structured to have the second position coordinate, as depicted in figure 2 of document D1 (cf. paragraph 'II. Description and Applications').

Hence, both the GEM structure with the matrix of electric field condensing areas and the anodes as read-out electrodes of the signal detector are arranged in two parallel superposed planes to form a device which acts as an amplifier for primary electrons as well as a position-sensitive signal detector.

3. The micro-groove detector (MGD) disclosed in document D3 comprises two arrays of microstrips arranged with arbitrary relative orientation on top of each other (cf. figure 1). A voltage potential difference between the layers creates a concentrated electric field in the grooves between them (cf. figure 2) which is high enough to produce sizeable gain. The electron avalanche charge is collected by the strip pattern on the bottom while positive ions flowing back to the top electrodes induce a current of equal size but opposite polarity. Reading out the signals collected on the anodes and cathodes thus provides 2-D positional information (cf. abstract; paragraph '2. The micro-groove detector concept'). A similar detector structure called Macro Gap Chamber (MGP) is disclosed in document D4 (cf. figure 4; paragraph '5. Conclusions').
4. It is further referred to document D5 which discloses a cathode mesh as a first electrode layer arranged on top of a parallel plane comprising an array of anode strips with an insulating mechanical joint between them (cf. figure 1; paragraph '2. Detector description'). Similar to the previous documents, the microwire detector according to document D5 combines high amplification and charge collection in one physical structure (cf. '1. Introduction' and '3. Detector performance'), too.
5. The cited prior art documents neither disclose, nor indicate, a detector structure comprising three sets of longitudinal electrodes disposed parallel to each other to form three superposed and parallel planes, wherein, when viewed from above, the direction of the longitudinal electrodes in each of said planes forms an angle with the

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IB2004/000276

direction of the longitudinal electrodes in each of the other planes. Therefore, the subject-matter of claim 1 meets the requirements of novelty and inventive step according to Articles 33(2) and (3) PCT.

6. Claims 2 to 11 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.